



NATIONAL INSTITUTE OF AEROSPACE

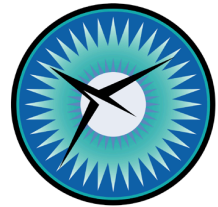
***A New Model in Collaborative Research
and Graduate Education***

**Presented to
NASA's Turning Goals into Reality (TGIR) Conference**

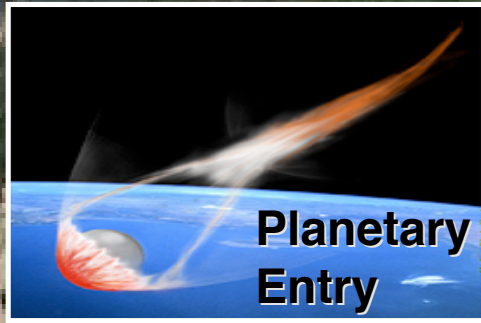
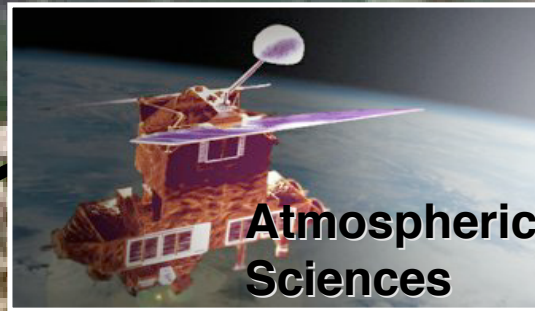
June 2003

Outline of Briefing

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- Origin and Mission of NIA (Bob Whitehead)
- Organization (Bob Whitehead)
- NIA Research Programs (Bob Lindberg)
- NIA Education and Outreach Programs (Bernie Grossman)



NASA Langley Research Center

Founded in 1917
First civil aeronautical
research laboratory

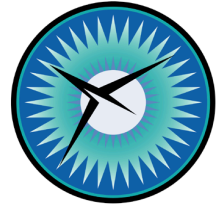
Programs
\$700M total FY 02

Facilities
\$4 billion investment

People
2400 Civil Servants
1400 Contractors

Why did NASA Create NIA?

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Objective:

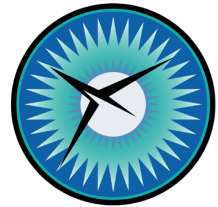
To create a strategic partner to conduct leading edge research in collaboration with Langley Research Center, create new knowledge, and build a better-educated workforce

Motivation:

To foster greater collaboration with academia to more fully leverage expertise both inside and outside NASA

What is NIA?

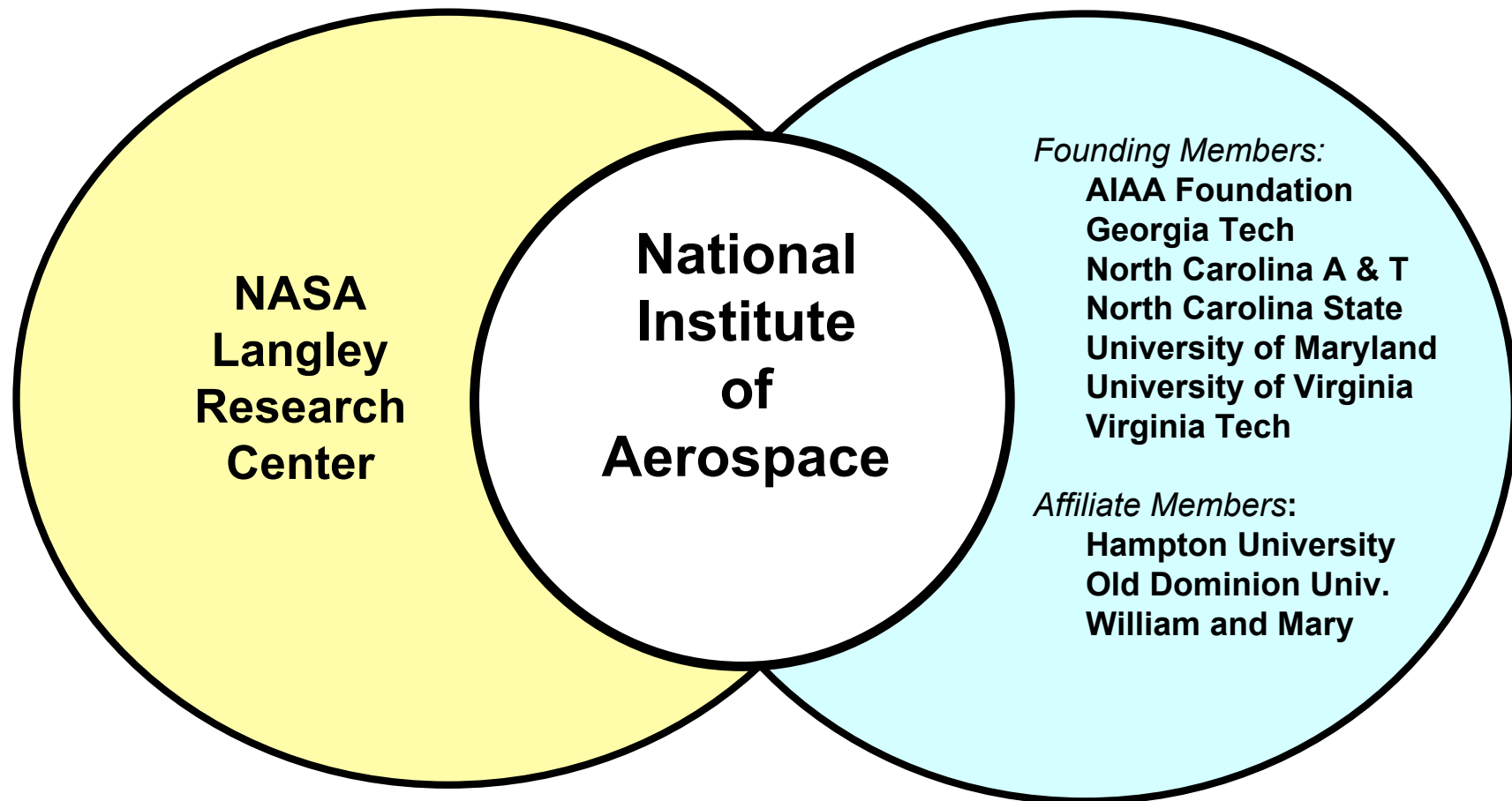
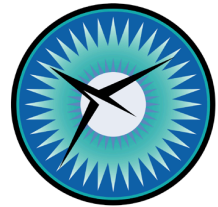
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- An Independent Private Non-profit Institution
- Leading Research Universities and AIAA Foundation
 - Six Founding Universities
 - Three Affiliate Universities
- Research and Graduate Education in Hampton Roads
- Established as a Strategic Partner with LaRC

The NASA-NIA Collaborative Partnership

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Cooperative Agreement Establishes a New Strategic Partnership

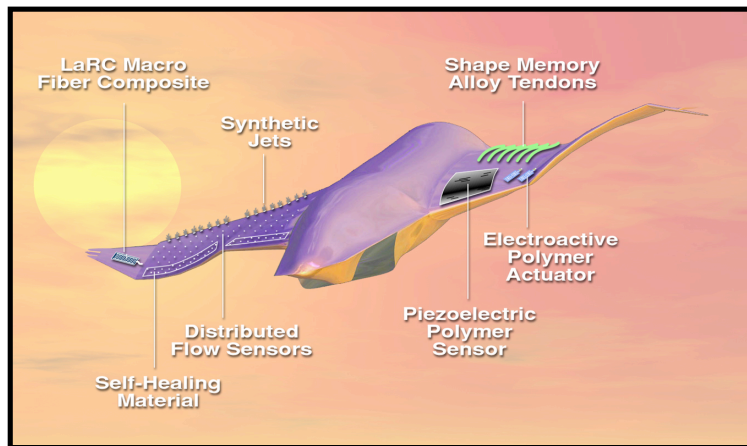
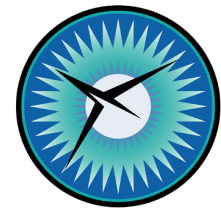
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- NIA/University/LaRC as Strategic Partners
 - Collaborative R&D Teams
 - Shared Resources and Shared Risks
 - Joint Ownership of Intellectual Property
 - Education for the Next Generation of Aerospace Leaders
- Foundation for Collaboration with Industry and Other Government Agencies

NIA Functional Requirements

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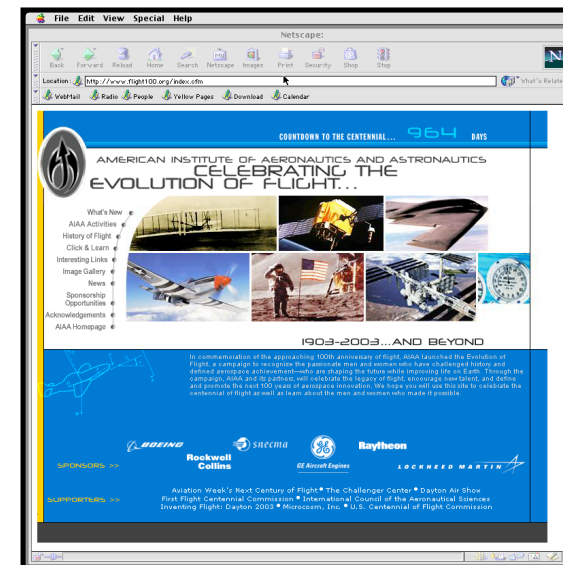
1. Aerospace and atmospheric sciences research



3. Commercialization of new intellectual property



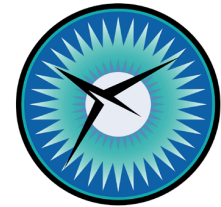
2. Graduate education in science and engineering



4. Promotion and outreach

Hampton Roads Center North Master Plan

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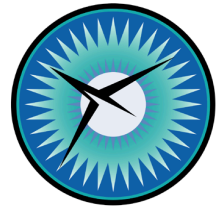


- Less than two miles from LaRC front gate
- Last tract owned by City of Hampton to create economic growth
- Master Plan: 235 acres
 - Business
 - Retail
 - Residential
- Research Campus Highlighted: 65 acres
- Phase 1: 8 acres



Research Campus Site Plan

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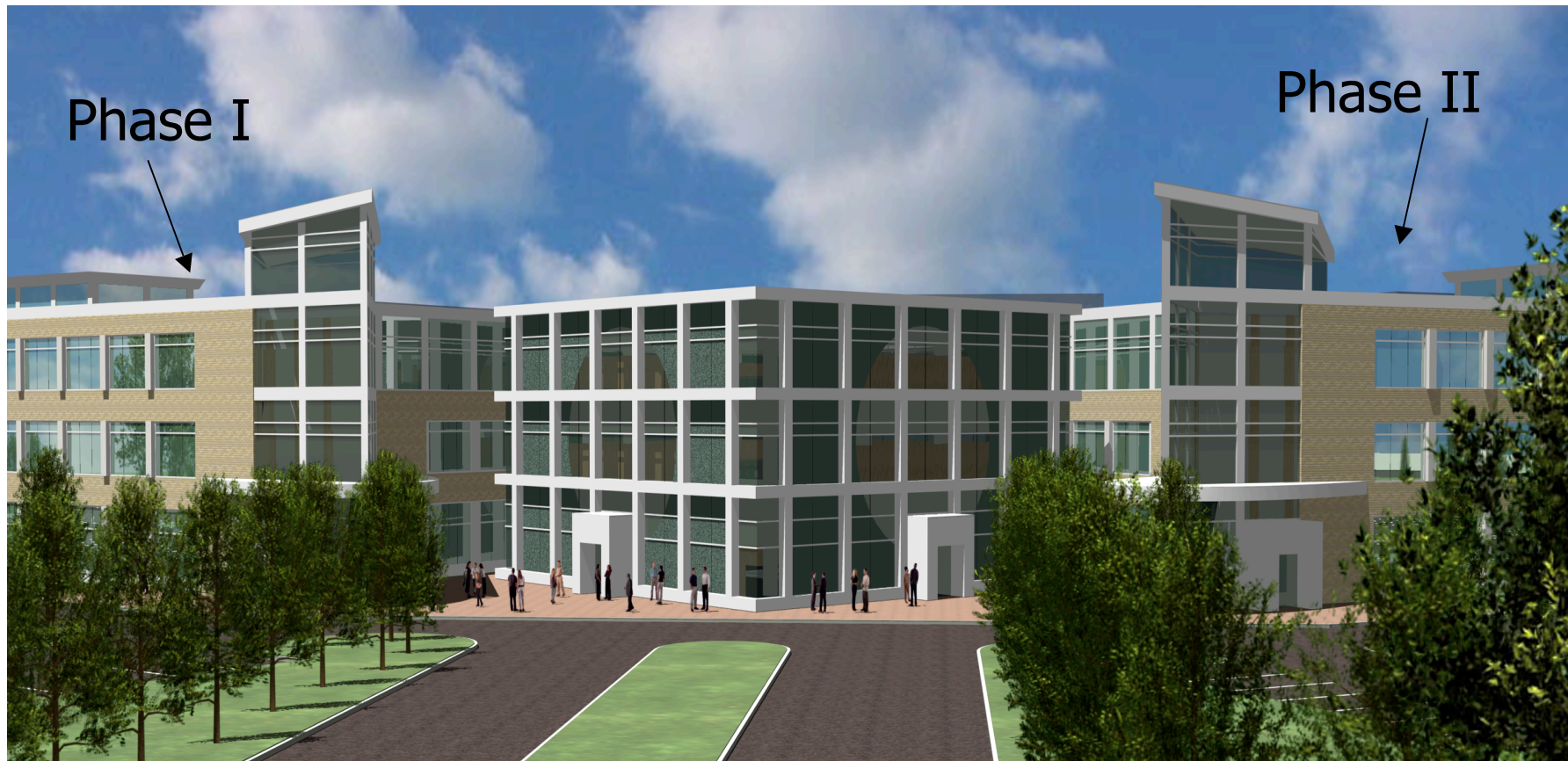
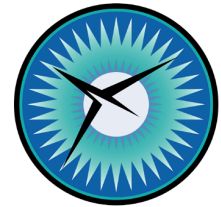


- Campus
Potential:
450,000 sq ft
- NIA
Headquarters
(Phase I):
60,000 sq ft



Main Elevation – Phases I and II

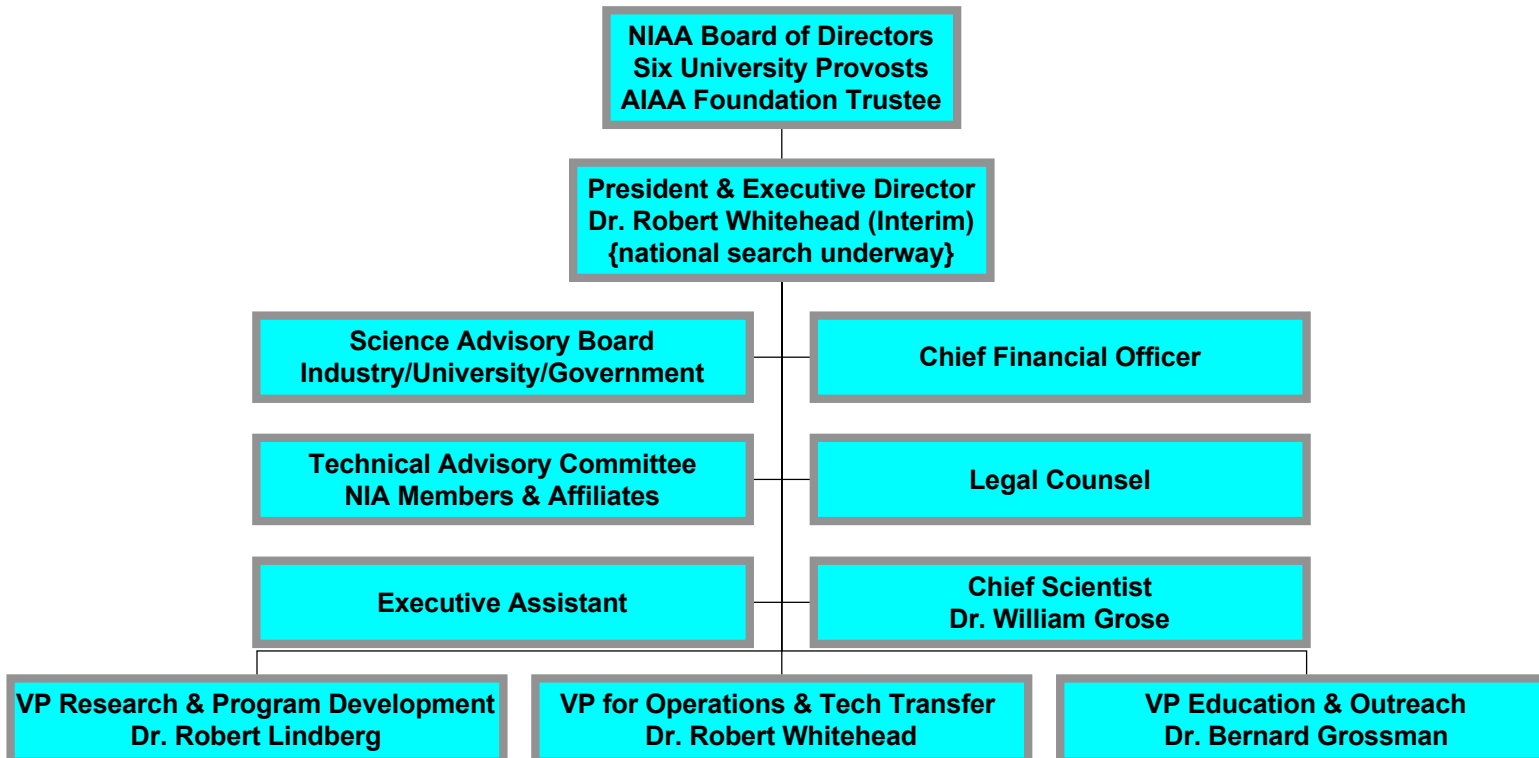
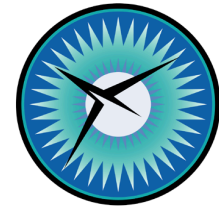
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National Institute of Aerospace

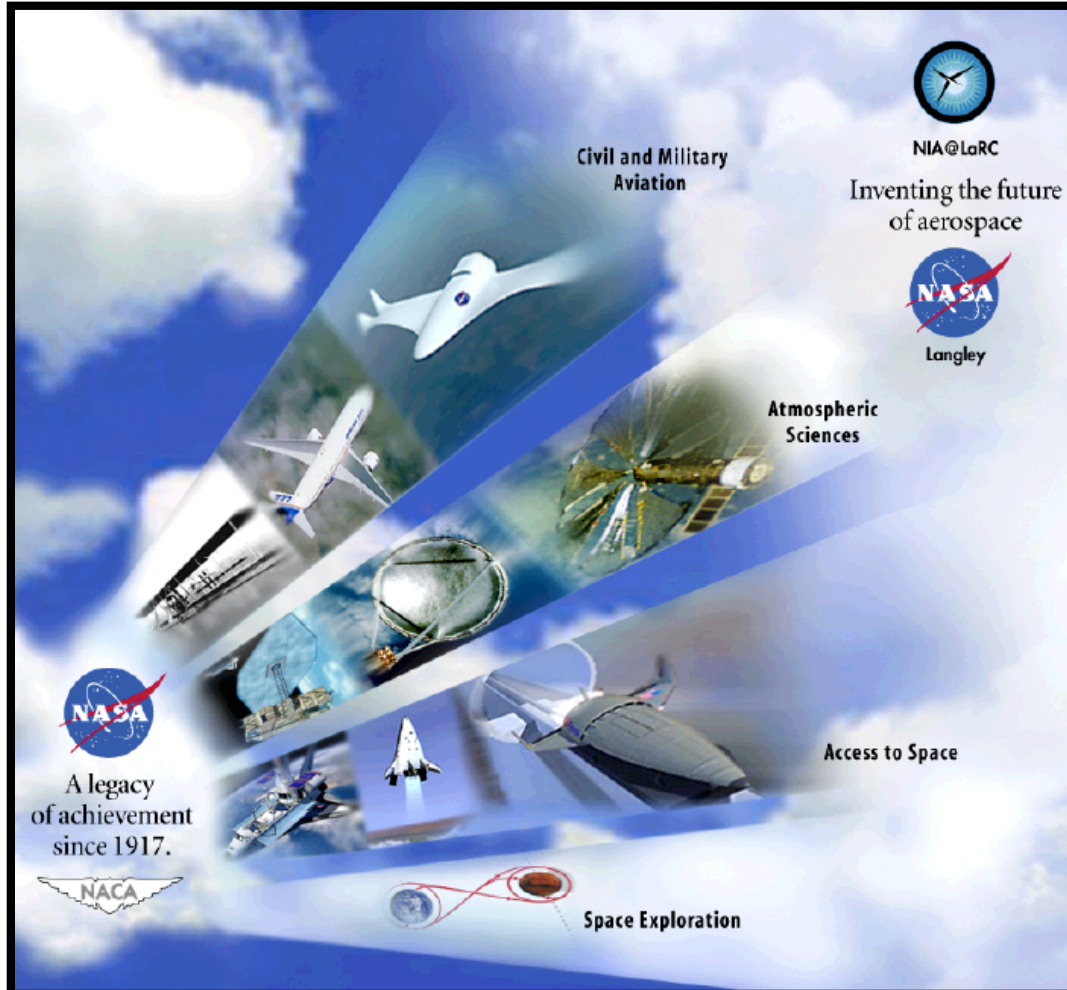
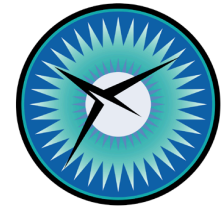
NIA Organization

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Cooperative Agreement Research Scope

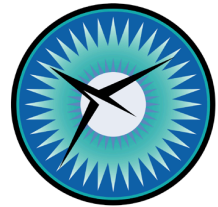
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- Aerospace Systems, Concepts, and Analysis
- Aerodynamics, Aerothermodynamics, and Acoustics
- Structures and Materials
- Airborne Systems
- Atmospheric Sciences and Sensor System Technologies
- Atmospheric Chemistry and Radiation Science
- Planetary Capture and Entry Technologies

NIA Offers Several Research Programs

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- **Langley Professor Program**
 - Established by NASA Cooperative Agreement and Focused on Key Multidisciplinary Growth Areas
- **University Research Program**
 - Conducted by Faculty and Students at Member Universities in Collaboration with NASA Research Staff
- **Resident Research Program**
 - Directly Funded by NASA Research Organizations and Conducted by NIA Resident Staff
- **3rd Party Research Program**
 - Sponsored by other Government Agencies
 - Conducted by Faculty, Staff, Langley Professors, NASA Research Staff, Students, and/or Industry Partners
- **Industrial Affiliates Program**
 - Conducted by NIA, Faculty, and/or NASA Research Staff in Collaboration with, and Funded by, Industrial Partners

Recruiting is Underway for Langley Professors

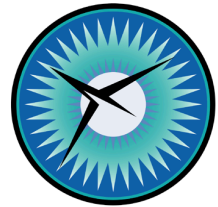
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- Earth System Science
- Advanced Aerospace Systems Architecture
- High Confidence Computational Systems
- Quantum/Molecular Materials Design for Sensors
- Multifunctional Design
- Smart, Adaptive Aerospace Vehicle Technology and Concept Development

Langley Professor Recruitment Process

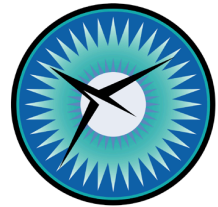
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- NASA and NIA Have Chosen Research Focus Areas that Hold the Best Promise for Growth Over the Next Decade
- One Full-time Appointment at Each Founding Member University
- Experience Commensurate with the Level of Tenured Full Professor
- Each Member University Follows Its Own Search Procedures
- Applicants Can Apply to All, Some, or Just One Member University
- Universities Will Seek Concurrence of Partners Before an Offer is Made
- Positions Have Been Advertised (see www.nianet.org) and Will Remain Open Until All Six Positions are Filled

Industrial Affiliates Program

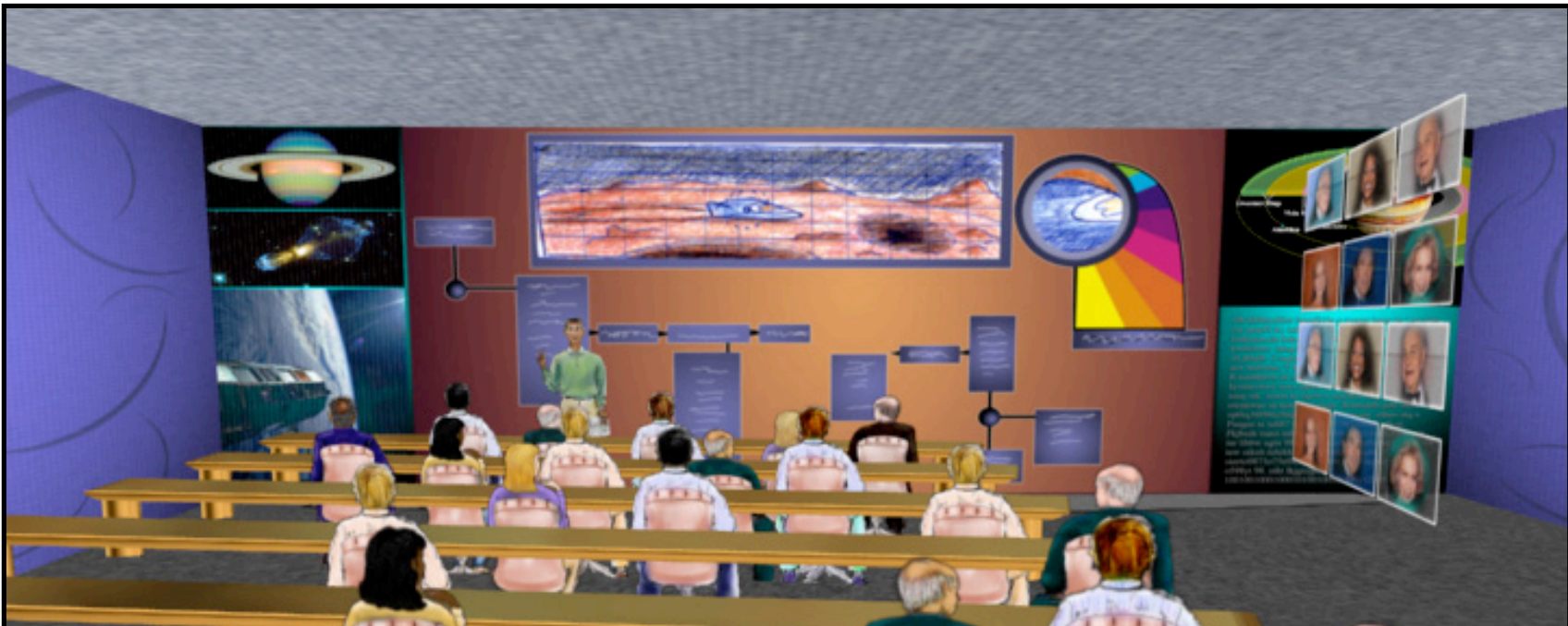
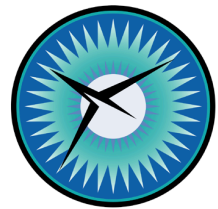
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- NIA Seeks Industry Partners for:
 - Joint Pursuit of External Research Opportunities
 - Collaboration on Industry-sponsored Research
 - Participation in NIA's Graduate Education Program
- Industrial Affiliates Benefits Can Include:
 - Teaming with NIA and LaRC on Competitive Opportunities
 - Collaborative IR&D with NIA and LaRC for Industry's Benefit
 - Access to NIA Intellectual Property (IP) and Shared Ownership of Jointly Developed IP
 - Short Course Offerings, Graduate Education for Employees, etc.
 - Staff Exchange Between Industry and NIA
 - Participation on NIA's Science Advisory Board

Collaborative Research and Education Environment

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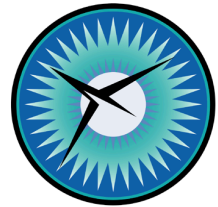


Leverage unique experimental facilities and laboratories wherever they are located.

Provide comprehensive curricula to a diverse student population wherever the students reside.

NIA Graduate Education Program

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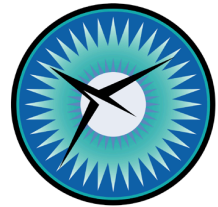


To provide a truly outstanding graduate education program in engineering and the sciences based on an unprecedented collaboration between six major research universities

- M.S. and Ph.D. offered from all six full-partner universities
 - Enrollment at one of the member universities
 - All residency requirements fulfilled in Hampton, Virginia
 - Up to 50% of coursework from other member schools
- Collaborative credit sharing enables availability of large suite of courses including advanced 'niche' courses at the Ph.D. level.
- On-site faculty presence including distinguished Langley Professors and Liaison Professors from each university, adjunct faculty from NASA, and on-site researchers.
- Large suite of courses available through local instruction and advanced distance learning.

NIA Graduate Students

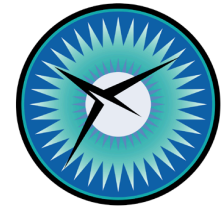
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- Full-time students at NIA: students for Langley and Liaison Professors, visiting students
- Full-time “Rising Star” fellowship students
 - Research on-site at NASA LaRC
 - Graduate education at NIA
 - Attract top US graduate students: \$26K (stipend, fellowship, travel) + tuition
- Part-time graduate students at NASA: civil servants, contractors
- Part-time graduate students at local industry and in the community

NIA Graduate Degree Programs (Fall 2003)

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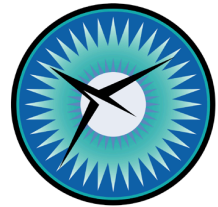
- Georgia Tech: Aero Eng, Mech Eng
- North Carolina A&T: Mech Eng (Spring 2004)
- North Carolina State: Aero Eng, Mech Eng
- University of Maryland: Aero Eng
- University of Virginia: Mech & Aero Eng., Materials Sci & Eng,
Elect & Computer Eng, Systems and Info
Eng, Eng Physics
- Virginia Tech: Aero Eng, Ocean Eng, Eng Mech,
Materials Sci & Eng, Mech Eng

Future Degrees Programs at NIA:

Meteorology, Atmospheric Chemistry, Computer Science, Applied Math

Sample Course Offerings (Fall 2003)

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More than 50 courses offered, including:

- Georgia Tech: Advanced Design Methods
Vibrations of Continuous Systems
- North Carolina State: Acoustics Radiation
Principles of Mechatronic Control
- University of Maryland: Helicopter Aerodynamics
Smart Structures
- University of Virginia: Electrical, Optical & Magnetic Properties of
Materials
Intro to Systems Engineering
- Virginia Tech: Advanced Aero/Hydrodynamics
Theory of Elasticity

Additional Education & Outreach Activities

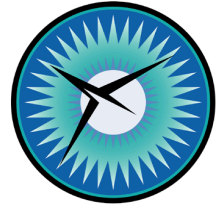
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- Short Courses
- Seminar Series
- Summer Visitors
- Workshop Program
- Outreach Program
 - Focused on K-16
 - Leveraged with NASA Education, Space Grants, University Partners
 - Summer Teacher Program

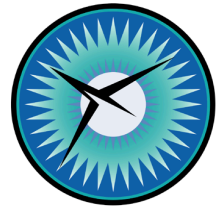
A Vision for the NASA-NIA Partnership

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**“Emerge as a National Leader in the
Resurgence of Aerospace Innovation
in the U.S.A.”**

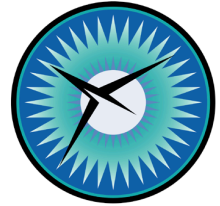
www.nianet.org



Backup Material

Earth System Science

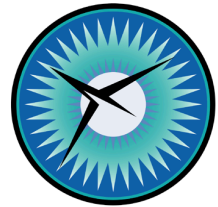
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- Investigations in integrating atmospheric sciences (chemistry, dynamics) with other Earth system disciplines (solar interaction, ocean & land sciences) to improve understanding & prediction of changes in whole Earth ecosystem

Advanced Aerospace Systems Architecture

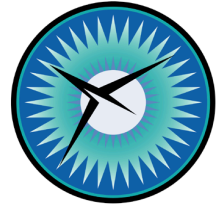
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- Innovative approaches to systems analysis to develop and integrate life-cycle and risk methodologies, economic models and reliability assessment for combined systems
- Create and use tools to address cost, operations, safety and risk for advanced aeronautical and space system architectures

High Confidence Computational Systems

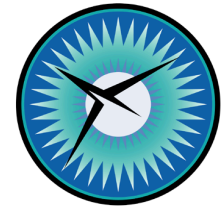
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- Innovative research in the fields of reliability, integrity, fault tolerance, and verification/validation for computer based systems that perform critical functions in aerospace vehicles
- Emphasis on machine intelligence, biocomputing, information management, human/machine interactions, and autonomous systems
- Responsive to requirements driven by environmental effects (lightning, electromagnetic interference, in-space radiation, and internal systems-generated thermal and vibration environments)

Quantum/Molecular Materials Design for Sensors

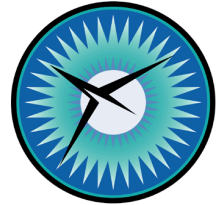
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- Engineering concepts and design for in situ and remote sensing applications in the entire electromagnetic spectrum
- Quantum/molecular designs for laser sources, optics, antennas, fiber optics lasers and tuning elements and novel detector architectures
- Sensing principals including mechanical, thermal, chemical, magnetic, biological, fluidic, optical, ultrasonic and mass

Multifunctional Design

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- Innovative research leading to development of aerospace design elements that perform multiple functions
- Develop new materials/structural concepts or innovative combinations of existing concepts that would be applied to aerospace vehicles and platforms
- Innovative analytical models and methods that simulate the physical response of candidate concepts
- Integrate models and methods into design tools

Smart, Adaptive Aerospace Vehicle Technology and Concept Development

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- Multidisciplinary research to enable efficient, multi-point vehicles providing performance on demand and operating in an integrated airspace vehicle environment
- Integrated research in such areas as active flow and noise control, unsteady fluid mechanics, adaptive structural concepts and distributed flight controls
- Exploration of bio-inspired approaches to controls and autonomous capabilities
- Potential application of bio-mimetic, nanostructured, multifunctional materials